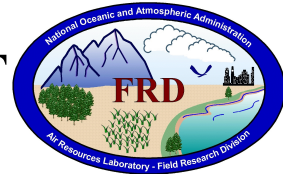


# FRD ACTIVITIES REPORT

## October 2006



### Research Programs

#### *UrbaNet/ARL*

Further progress was made in determining how Model Output Statistics (MOS) might be applied to forecasting winds and turbulence in urban areas. Normally, MOS forecasts are generated by using a linear regression based on both model outputs and local field observations. However, recent changes at the NWS open up some other opportunities for generating an urban MOS-type forecast. NWS forecasts are now being digitized on a  $5 \text{ km} \times 5 \text{ km}$  horizontal grid as part of the National Digital Forecast Database (NDFD). Rather than developing an urban MOS forecast based on one specific numerical model (e.g., GFS or NAM), better results might be obtained by treating the NDFD as a composite "model" for inclusion in a MOS approach. A potential benefit of using the NDFD is that it incorporates the local expertise at the NWS forecast offices. Further work will be required to determine if the NDFD winds really meet the needs of the UrbaNet program. (Richard Eckman, 208-526-2740)

#### *UrbaNet/Urban Dispersion Program*

Research continued on the Salt Lake City URBAN 2000 data set. The experiments were conducted in stable, nocturnal conditions ranging from those dominated by a well-established drainage flow regime to those significantly affected by synoptic scale influences. Preliminary results suggest that topography plays a dominant role in controlling plume dispersion in the downtown area and nearby suburbs in these conditions. The local topography both guided the drainage flows and affected the wind field in the downtown area. Plume movement was often observed to be contrary to the measured winds, especially winds measured at higher elevations above the surface. The goal is to consolidate this research into draft manuscript form for eventual submission for journal publication. (Dennis Finn, 208-526-0566)

#### *ET Probe*

The paper entitled "A Pressure-Sphere Anemometer for Measuring Turbulence and Fluxes in Hurricanes" was formally accepted for publication in the *Journal of Atmospheric and Oceanic Technology* during October. The follow-on work to this paper will concentrate on the ET probe data collected in Hurricanes Frances and Ivan. There was also some encouraging news related to PPBES, in that a program involving the ET probe appeared on an OAR Integrated Priority List. Currently, the probe is linked in PPBES to both the Science, Technology, and Infusion program and to the recent NOAA hazard resilient communities effort. (Richard Eckman, 208-526-2740)

### ***Smart Balloon***

In an effort to decrease weight and simplify operation of the smart balloon, a larger helium pressure relief valve is being developed to serve as the flight termination or cut-down mechanism. The current cut-down mechanism of the smart balloon has been a thin diaphragm with a resistance wire around the perimeter. The diaphragm is at the top of the helium bladder and is activated when a high current is sent through the thin resistance wire causing the diaphragm to melt around the perimeter. The diaphragm is pushed out of the way by internal balloon pressure and pulled by an external spring so the helium is able to freely flow out of the internal balloon bladder. The new larger helium pressure relief valve will use a pinch mechanism similar to one already in use, but with larger components that will allow it to work with a 0.625" diameter hose rather than the present 0.25" diameter hose. If the new valve works well for this function, the same type of valve will be used as an air ballast release valve. A larger valve for the ballast release will allow quicker response to precipitation or other factors that may cause the balloon to descend below the desired operating elevation. (Randy Johnson, 208-526-2129)

### ***Perfluorocarbon Tracer Analysis Development***

The perfluorocarbon tracer (PFT) analysis development focused on (1) extending the dynamic range of concentrations available for measurement and (2) evaluating the possibility of successfully measuring more PFTs in addition to PDCB and PMCH as described in last month's report. First, while a more comprehensive evaluation is still necessary, tests have shown that it is likely that measurements can be made at concentrations up to at least 100,000 pptv. The analysis method had previously been tested at concentrations up to 250 pptv. Second, it was established that m-PDCH could also be measured without adding excessively to the run time. The analysis method used is similar to that described in the September monthly report with adjustments of the isothermal temperature (to 170° C), gas flow rates, and other operational parameters. The total run time is about 5½ minutes for the three analytes listed. Attempts to include a fourth PFT, PMCP, were not successful due to the fact that it elutes very close to PDCB unless some very time consuming steps are taken. (Dennis Finn, 208-526-0566)

## **Cooperative Research with DOE NE-ID (Idaho National Laboratory)**

### ***Emergency Operations Center (EOC)***

Each NOAA team member must participate in either a drill, exercise, or activation and one requalification classroom training session during the year in order to maintain their INL EOC Emergency Response Organization qualification. Teams A, B, and D completed their requalification classroom training this month. The requalification drills and exercises for each team were completed earlier in the year. (Jason Rich, 208-526-9513)

## INL Climatology

The 2<sup>nd</sup> Edition of the INL climatology is now available in a PDF file. The 2<sup>nd</sup> edition was originally published back in December 1989 but is no longer available to the public in print. With the 3<sup>rd</sup> Edition of the INL Climatology expected to be published within the next few months, readers will now have access to the 2<sup>nd</sup> Edition online. This step is necessary since the 3<sup>rd</sup> Edition extensively references the 2<sup>nd</sup> Edition. (Jason Rich, 208-526-9513)

## Wind Profilers

Repairs to the support structure of the existing INL 915 MHz wind profiler were completed this month. One section of the wooden structure had been damaged by wind and weathering over eight years of use. We are also in the process of installing an ASC minisodar co-located with the 915 MHz profiler. (Roger Carter 208-526-2745, Tom Strong)

## INL Tornado Warning

Late in the afternoon of October 4, a tornado warning was issued for the southern portion of the INL by the Pocatello National Weather Service. The warning was received over the NOAA All Hazards Weather Radio. Warning Communications Center (WCC) immediately notified facility emergency managers through the D-Net Radio and indicated that CFA and RWMC would likely be affected. We had been tracking the thunderstorm with our new radar display and storm tracking capability incorporated into the iWatch software that had been recently acquired from Weather Decision Technologies in Norman, OK. The iWatch software also includes a real-time lightning strike map from the United States Lightning Protection Network, a private company also located in Norman. Our analysis (Fig. 1) showed that

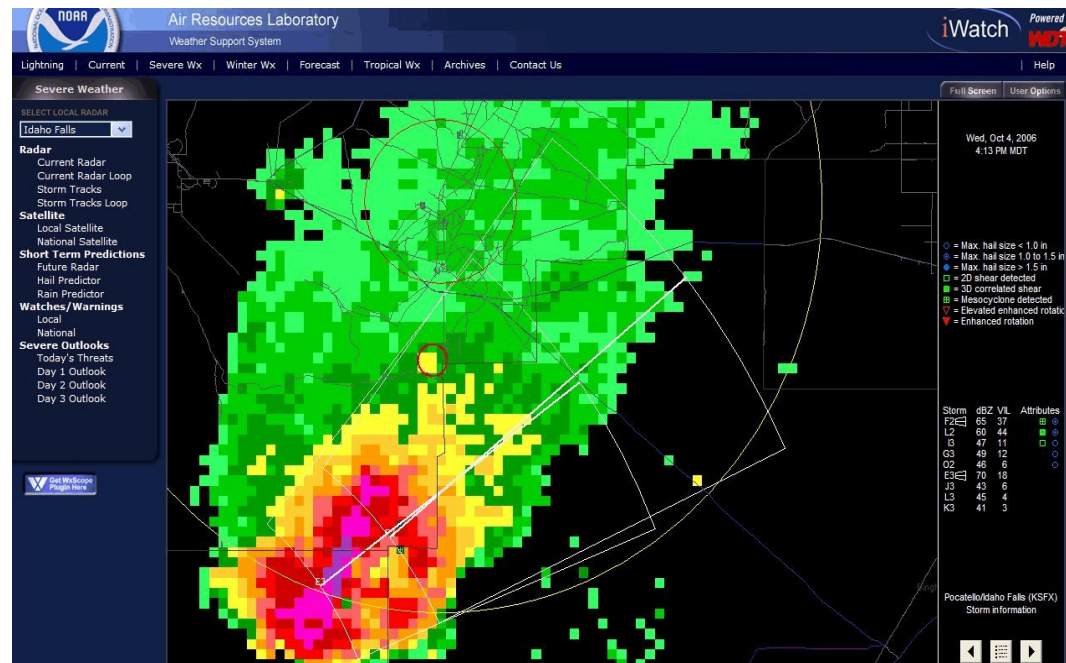


Figure 1. Severe thunderstorm south of the INL at 16:13 MDT on October 4, 2006, as indicated by NWS NEXRAD radar. Predicted storm track is indicated with the two cones. Radar analysis indicated two storm centroids with hail 1.0 to 1.5" diameter. Mesocyclone activity was indicated at position F2.

RWMC and CFA would not be affected, but that MFC would instead be affected. We notified WCC of our analysis, and also kept our DOE COR and the BEA Emergency Management director informed via email. This was indeed a very severe

storm with mesocyclone activity detected together with hail 1.0-1.5" diameter. We continued to monitor the storm track. At 16:22 MDT, radar indicated a probable tornado (Fig. 2) south of the INL with a predicted track east of MFC. Tornado activity continued to be detected intermittently through at least 17:12 MDT (Fig. 3) when the storm began to weaken. We followed the storm with our weather camera located at Grid 3 (Fig 4.) and also monitored lightning associated with the storm (Fig. 5). The FRD duty forecaster remained on duty after regular work hours for consultation until the threat of severe weather ended.

A subsequent meeting was held on October 11 at FRD to

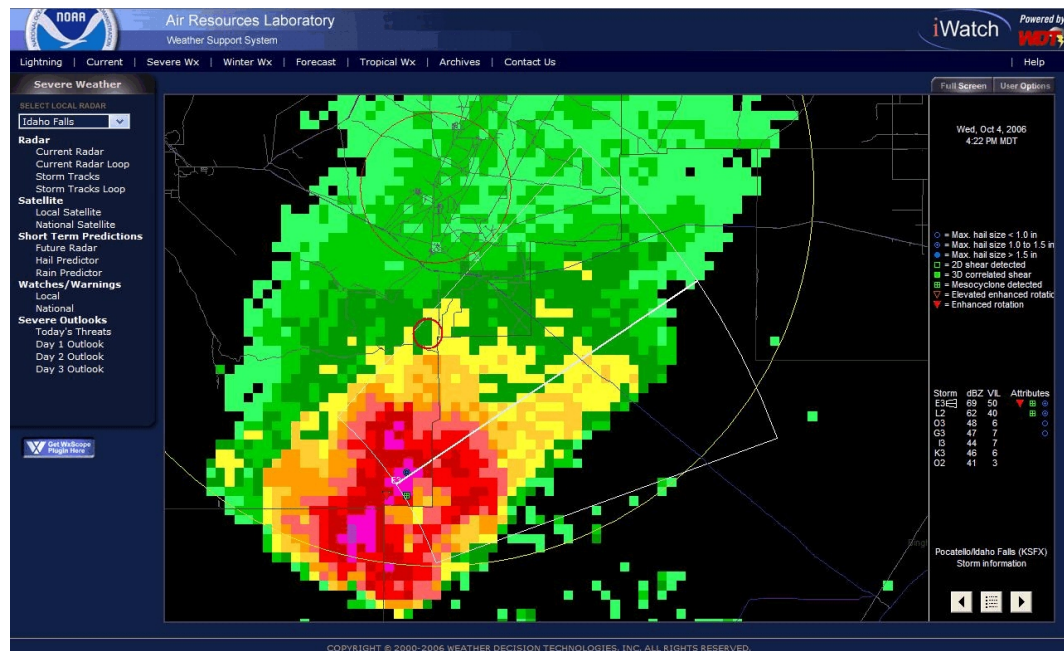


Figure 2. Severe thunderstorm from NWS NEXRAD radar at 16:22 MDT on October 4, 2006. Location of tornadic activity is indicated by the inverted red triangle.

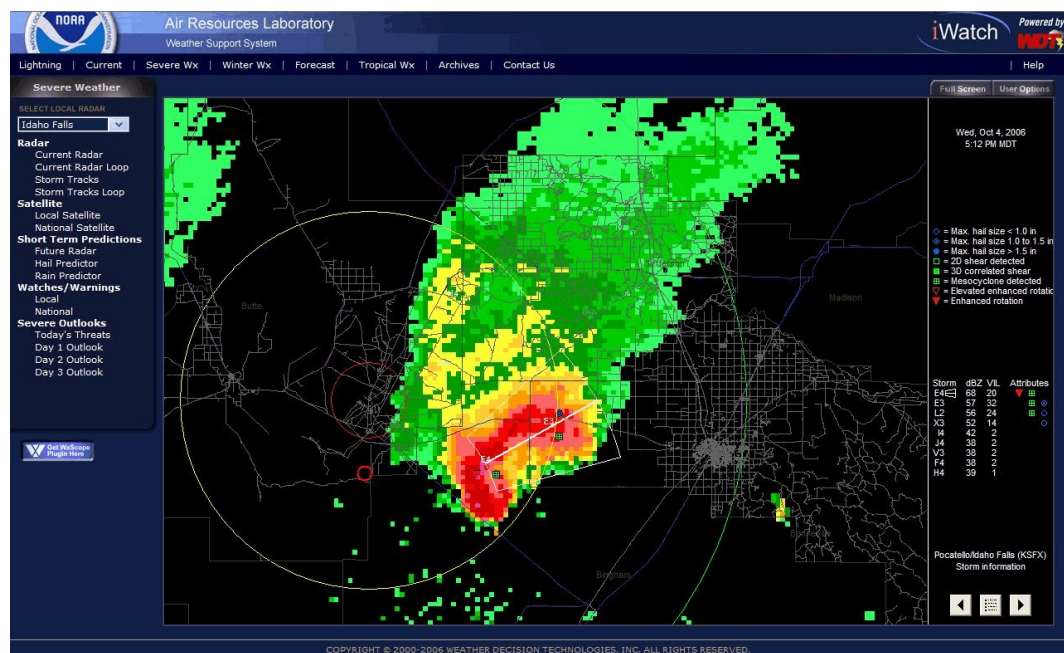


Figure 3. Continued tornadic activity indicated by NWS NEXRAD radar at 17:12 MDT. Storm is beginning to shear to the northwest.



discuss severe weather warnings for INL and FRD's responsibilities and capabilities. In attendance were personnel from the Pocatello National Weather Service and emergency management personnel from Battelle Energy Alliance. It was decided that NWS would be the primary source of warnings for the INL, since FRD is not a 24/7 operation. However, FRD would refine the NWS warnings and transmit that information to the WCC when appropriate and when the FRD duty forecaster is on duty. NWS would also refine its warnings and include 4 warning areas from the INL. We are working with NWS to incorporate those features in their warnings. (Kirk Clawson 208-526-2742 and staff)



Figure 4. NOAA ARLFRD weather camera image of severe thunderstorm and tornado acquired at 16:25 MDT. The eastern edge of Big Southern Butte is visible to the right and the stack at INTEC is visible to the left of center.

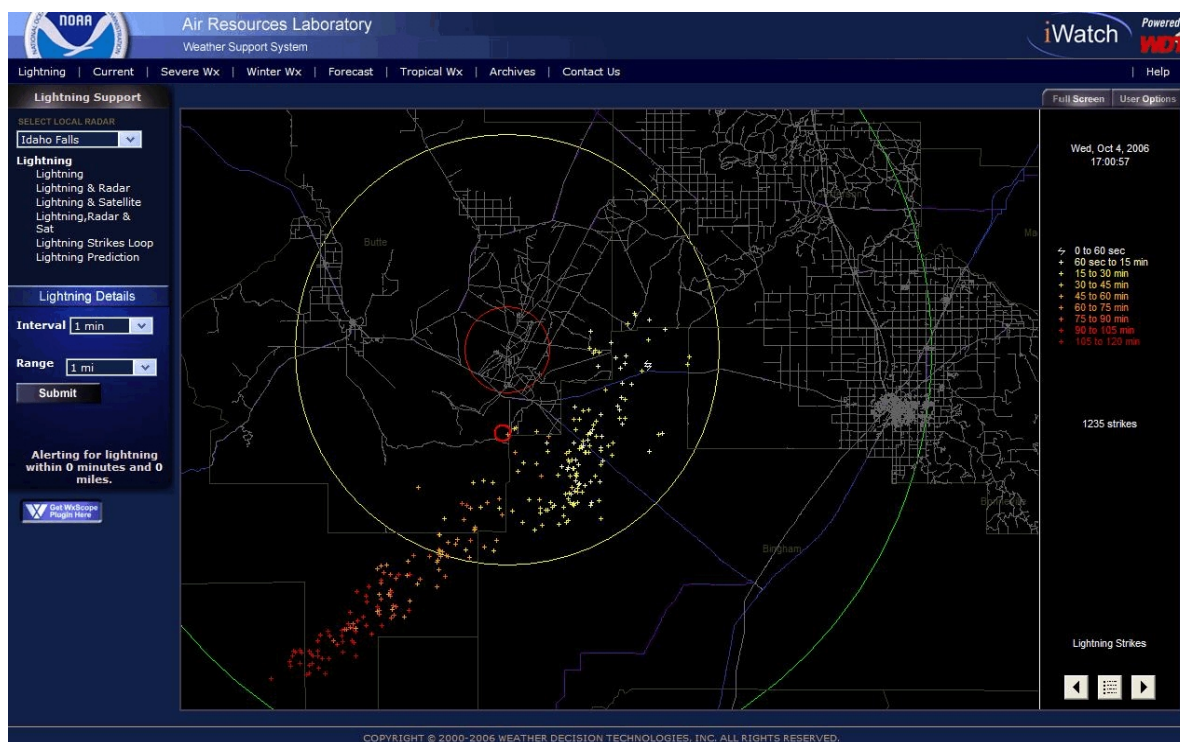


Figure 5. Lightning strikes from the October 4 severe thunderstorm.

## **Other Activities**

### ***Papers***

Mao, H., R. Talbot, D. Troop, R. Johnson, S. Businger, and A.M. Thompson (2006): Smart Balloon Observations over the North Atlantic: Part II – O3 Data Analysis and Modeling. *J. Geophys. Res.*, 111, D23S56, doi:10.1029/2005JD006507.

Businger, S., R. Johnson, and R. Talbot, 2005: Scientific Insights from Four Generations of Lagrangian Balloons in Atmospheric Research. *Bulletin of the American Meteorology Society*. Volume 87, No. 11, pp. (In press)

Eckman, R. M., R. J. Dobosy, D. L. Auble, T. W. Strong, T. L. Crawford, 2006: A pressure-sphere anemometer for measuring turbulence and fluxes in hurricanes. *Journal of Atmospheric and Oceanic Technology*. (Accepted)

### ***Safety***

The video “The Good Old Days of Safety” was shown at the monthly staff meeting.

### ***Personnel***

Deborah J. Lacroix, Physical Scientist, resigned from federal service on October 10, 2006. Debbie accepted a job as Senior Chemist with an environmental company based in Idaho Falls. Debbie worked at FRD for over six years.

Donna Mills, Administrative Assistant with NOAA, National Weather Service in Pocatello, ID, was selected for the Administrative Assistant position at FRD. Donna will begin her FRD employment on November 13, 2006.